USER MANUAL

Accessory 8M

Mini-PMAC Extender Board

3Ax-603410-xUxx

October 29, 2003

DELTA TAU
Data Systems, Inc.
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21314 Lassen Street Chatsworth, CA 91311 // Tel. (818) 998-2095 Fax. (818) 998-7807 // www.deltatau.com

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To report errors or inconsistencies, call or email:

Delta Tau Data Systems, Inc. Technical Support
Phone: (818) 717-5656
Fax: (818) 998-7807
Email: support@deltatau.com
Website: http://www.deltatau.com

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INTRODUCTION

The Accessory 8M Mini-PMAC Extender Board, part number 603410-10x, is designed to extend the capability of the 2-channel Mini-PMAC board to interface to an extra pair of analog velocity-mode or torque-mode amplifiers, or a single additional "sine-wave" amplifier. The extender board picks up the digital signals for the extra 2 analog outputs that are generated, but not utilized, on the Mini-PMAC, converts them to analog format, and outputs them to the drive. It also buffers and isolates the amplifier-enable outputs and the amplifier-fault inputs for these two channels.

The two interface channels on the extender board are labeled Channels 3 and 4. The amplifier interface lines for Channels 1 and 2 are on the Mini-PMAC board itself. Encoder inputs for Channels 3 and 4 are provided standard on the Mini-PMAC. If home and limit flag inputs are desired for Channels 3 and 4, Option 14M can be purchased for the Mini-PMAC, which provides these inputs on the Mini-PMAC itself.

Setting up the Board

Very little preliminary setup is required for the extender board before it is connected to the system.

Jumpers E1A and E1B control the format of the amplifier-enable output for Channel 3.

- Connect pins 1 and 2 of E1A and pins 1 and 2 of E1B for a sinking output on AENA3.
- Connect pins 2 and 3 of E1A and pins 2 and 3 of E1B for a sourcing output on AENA3.
- Connect pins 1 and 2 of E1A and pins 2 and 3 of E1B for a sinking/sourcing (totem-pole) output on AENA3.

Fuse F1 limits the current of AENA3 to 0.5A in either direction.

Jumpers E2A and E2B control the format of the amplifier-enable output for Channel 4.

- Connect pins 1 and 2 of E2A and pins 1 and 2 of E2B for a sinking output on AENA4.
- Connect pins 2 and 3 of E2A and pins 2 and 3 of E2B for a sourcing output on AENA4.
- Connect pins 1 and 2 of E2A and pins 2 and 3 of E2B for a sinking/sourcing (totem-pole) output on AENA4.

Fuse F2 limits the current of AENA4 to 0.5A in either direct.

CONNECTING THE BOARD

Power-Supply Connection

The extender board requires an external unregulated +/-12V to +/-15V supply for its analog circuits. This supply must be brought in on TB2. The supply used can be the same as that used for the analog circuits on the Mini-PMAC itself. If it is desired to maintain the provided optical isolation between this analog circuitry and the digital 5V circuitry on the Mini-PMAC itself, this must be a separate supply from the 5V supply for the Mini-PMAC, and the analog common (AGND) must not be tied to the digital common (GND), except possibly at the signal system "star" grounding point.

The digital 5V circuitry on the extender board is supplied automatically through the cable from the Mini-PMAC board.

Note

The green "power-good" LED on the board (component D9) will be lit only if all of the following signals are present:

- The A+12V/+15V positive analog supply
- The A-12V/-15V negative analog supply
- The A+5V internal analog supply from the on-board regulator
- The DAC clock signal from the Mini-PMAC

If any of these signals is not present, the D9 LED will go off, and the on-board relay supplying power to the output op-amps will open, disabling the analog outputs.

Mini-PMAC Connection

The extender board is connected to the Mini-PMAC through the provided 16-strand flat cable. This cable connects header JS1 on the extender board to header J7 on the Mini-PMAC.

The J7 header on the Mini-PMAC can also be used to connect the Mini-PMAC to the ACC-28A or ACC-28B A/D-converter board. To connect the Mini-PMAC to both an ACC-28 board and an extender board, daisy-chained them on a 3-drop cable. There is no signal or address conflict between these two accessory boards.

Amplifier Connection

The analog command outputs, the amplifier-enable/direction outputs, the amplifier fault inputs, and the AGND reference voltage of the extender board are connected to the amplifier(s) through terminal block TB1.

The analog command outputs can be connected as single-ended outputs, in which the command voltage is the voltage of DAC+ with respect to AGND. In this case, the DAC- pin should be left floating – do not ground this output if you are not using it! Alternately, the analog outputs can be used in differential mode, in which the command voltage is the voltage of DAC+ with respect to DAC-. In this case, it is still important to tie the AGND reference voltage of the extender board to the analog reference voltage of the amplifier.

If Option 14M, which provides all of the flag inputs for Channels 3 and 4, is present on the Mini-PMAC, the amplifier-fault inputs FAULT3 and FAULT4 can be brought in either on the extender board, or the Mini-PMAC itself. If the rest of the amplifier signal connections for these channels are brought in on the extender board, it is probably advisable to bring the fault signals in on the extender board also. Whichever input is not used should be left floating to avoid signal conflict.

SETTING UP THE MINI-PMAC

Analog Outputs

The two D/A converters on the extender board appear as DAC3 and DAC4 to the Mini-PMAC software, just as if they were on-board D/A converters. The value written into the high 16 bits of Y:$C00B creates a proportional voltage on the DAC3 and DAC3/ outputs; the value written into the high 16 bits of Y:$C00A creates a proportional voltage on the DAC4 and DAC4/ outputs.

To use the extender board for servo outputs when Mini-PMAC is not commutating the motor, Ix02 for the motor must contain the address of the individual DAC register used in its low 16 bits: $C00B for DAC3, and $C00A for DAC4. These are the default values for I302 and I402, respectively. Normally, bit 16 of Ix02 is set to 0; it should be set to 1 if the DAC register is to receive the unsigned magnitude of the servo command value (the AENA line outputs the sign of the command in this mode).

To use the extender board for a pair of analog outputs ("sine-wave outputs"), when Mini-PMAC is commutating the motor, Ix02 for the motor must contain the lower address of the DAC pair used in its low 16 bits: $C00A for DAC3 and DAC4. Normally, bit 16 of Ix02 is set to 0; it should be set to 1 when the sine-wave output pair is used for open-loop "direct microstepping" commutation.

Enable and Fault Flags

To use the AENA outputs on the extender board as the automatic amplifier-enable control lines or the FAULT inputs as the automatic amplifier-fault status lines, Ix25 must contain the address of the flag register used in its low 16 bits: $C008 for Channel 3; $C00C for Channel 4. These are the default values for I325 and I425, respectively. The high 8 bits of Ix25 control whether the individual lines are used, and how they are used.

It is also possible to use the amplifier-enable outputs as general-purpose digital outputs. To do this, make sure they are not used for the automatic amplifier-enable function. Typically this is done by setting bit 16 of Ix25 to 1 (e.g. I325=$1C008). Then an M-variable can be assigned to the amplifier-enable control bit. M314 is the suggested M-variable for AENA3; M414 is the suggested M-variable for AENA4 (see the suggested M-variable definitions in the PMAC Software Reference Manual).

The amplifier-fault inputs can be used as general-purpose digital inputs. To do this make sure they are not used for the automatic amplifier-fault function. Typically, this is done by setting bit 20 of Ix25 to 1 (e.g. I325=$10C00B). Then an M-variable can be assigned to the amplifier-fault status bit. M323 is the suggested M-variable for FAULT3; M423 is the suggested M-variable for FAULT4 (see the suggested M-variable definitions in the PMAC Software Reference Manual).

JUMPER DESCRIPTIONS

E1A

- Jump pins 1 and 2 to tie driver IC output for AENA3 to cathode of blocking diode. If E1B also connects pins 1 and 2, diode blocks sourcing of current by the driver IC output, permitting sinking of current only. If E1B connects pins 2 and 3, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.
- Jump pins 2 and 3 to tie driver IC output for AENA3 to anode of blocking diode. If E1B also connects pins 2 and 3, diode blocks sinking of current by the driver IC output, permitting sourcing of current only. If E1B connects pins 1 and 2, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.

E1B

- Jump pins 1 and 2 to tie anode of blocking diode to output terminal block pin for AENA3. If E1A also connects pins 1 and 2, diode blocks sourcing of current by the driver IC output, permitting sinking of current only. If E1A connects pins 2 and 3, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.
- Jump pins 2 and 3 to tie cathode of blocking diode to output terminal block pin for AENA3. If E1A also connects pins 2 and 3, diode blocks sinking of current by driver IC output, permitting sourcing of current only. If E1A connects pins 1 and 2, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.

E2A

- Jump pins 1 and 2 to tie driver IC output for AENA4 to cathode of blocking diode. If E2B also connects pins 1 and 2, diode blocks sourcing of current by the driver IC output, permitting sinking of current only. If E2B connects pins 2 and 3, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.
- Jump pins 2 and 3 to tie driver IC output for AENA4 to anode of blocking diode. If E2B also connects pins 2 and 3, diode blocks sinking of current by the driver IC output, permitting sourcing of current only. If E2B connects pins 1 and 2, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.

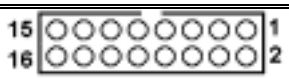
E2B

- Jump pins 1 and 2 to tie anode of blocking diode to output terminal block pin for AENA4. If E2A also connects pins 1 and 2, diode blocks sourcing of current by the driver IC output, permitting sinking of current only. If E2A connects pins 2 and 3, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC.
- Jump pins 2 and 3 to tie cathode of blocking diode to output terminal block pin for AENA4. If E2A also connects pins 2 and 3, diode blocks sinking of current by driver IC output, permitting sourcing of current only. If E2A connects pins 1 and 2, diode does not block current in either direction, permitting sinking and sourcing of current by driver IC

CONNECTOR DESCRIPTIONS

JS1: A/D Port Connector

JS1 (16-Pin Header)

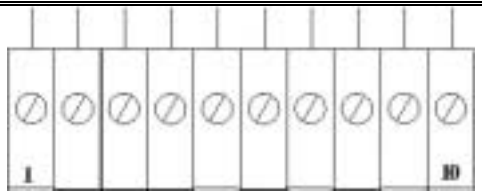


Front View

Symbol	Function	Description	Notes
DCLK	Input	D to A, A to D Clock	DAC and ADC clock for Channels 1, 2, 3, 4
BDATA1	Input	D to A Data	DAC data for Channels 1, 2, 3, 4
ASEL0/	N.C.		
ASEL1/	Input	Chan Select Bit 1	Select for Channels 3, 4
CNVRT01	N.C.		
ADCIN1	N.C.		
OUT1/	N.C.		
OUT2/	N.C.		
OUT3/	Input	Amp Enable/Dir	Amp enable/dir for Channel 3
OUT4/	Input	Amp Enable/Dir	AMP enable/DIR. for Channel 4
HF41	N.C.		
HF42	N.C.		
HF43	Output	Amp Fault	Amp fault signal for Channel 3
HF44	Output	Amp Fault	Amp fault signal for Channel 4
+5V	Input	+5V Supply	Power supply
GND	Common	Digital Reference	

TB1: Amplifier Connector

TB1 (10-Pin Terminal Block)

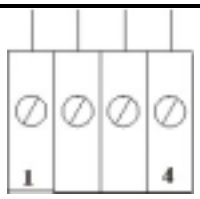


Front View

Symbol	Function	Description	Notes
AGND	Common	Analog Reference Voltage	
DAC3+	Output	Positive Analog Command	+/-10V with respect to AGND
DAC3-	Output	Negative Analog Command	+/-10V with respect to AGND
AENA3	Output	Amplifier Enable / Direction Command	Software selected function; Hardware selected polarity & format
FAULT3	Input	Amplifier Fault Signal; Channel 3	Software selected polarity
AGND	Common	Analog Reference Voltage	
DAC4+	Output	Positive Analog Command	+/-10V with respect to AGND
DAC4-	Output	Negative Analog Command	+/-10V with respect to AGND
AENA4	Output	Amplifier Enable / Direction Command	Software selected function; Hardware selected polarity & format
FAULT4	Input	Amplifier Fault Signal; Channel 3	Software selected polarity

TB2: Power-Supply Connector

TB2 (4-Pin Terminal Block)



Front View

Pin #	Symbol	Function	Description	Notes
1	A+15V	Input	Analog Positive Input Supply	+12V TO +15V, Unregulated
2	AGND	Common	Analog Reference Voltage	Isolated from digital common
3	A-15V	Input	Analog Negative Input Supply	-12V TO -15V, Unregulated
4	AGND	Common	Analog Reference Voltage	Isolated from digital common